

## REMARKS

This is intended as a full and complete response to the Final Office Action dated June 15, 2009, having a shortened statutory period for response set to expire on September 15, 2009. Please reconsider the claims pending in the application for reasons discussed below.

Claims 1-5 and 7-24 remain pending in the application and are shown above. Claim 6 has been cancelled. Claims 1-5 and 7-24 have been rejected by the Examiner. Claim 19 has been amended to clarify the invention. Reconsideration of the rejected claims is requested for reasons presented below.

### Claim Rejections Under 35 U.S.C. § 103

Claims 1-4, 12, 14-18, and 22-24 are rejected under 35 U.S.C. § 103(a) as being unpatentable over *Tsutsumi et al.* and *Baum et al.* (USPN 4,889,995) in view of *Baum* (WO 98/54750).

To establish prima facie obviousness of a claimed invention, all of the claim limitations must be taught or suggested by the prior art. (*In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA)).

Applicants respectfully submit that *Tsutsumi* as modified by *Baum* and considered together as a whole, do not teach, disclose, or suggest a charged particle beam device having a residual gas diffusion barrier separating the first and the second UHV regions wherein the residual gas diffusion barrier is in beam direction directly subsequent to the emitter and acts as an electrode for extracting or modulating emitted charged particles, as recited in independent claims 1, 14, and 18, and these differences between independent claims 1, 14, and 18 and the combined teachings of the cited references would not have been obvious to one of ordinary skill in the art at the time the invention was made.

*Tsutsumi* discloses an analysis apparatus which employs electrons and in which a rotary vacuum pump evacuates gas or air from a specimen exchange chamber. (*Tsutsumi*, Abstract.) According to Fig. 1, a scanning electron microscope 1 includes a microscope column 2 and a specimen chamber 3 formed below the microscope column 2. (*Tsutsumi*, col. 2, ll. 56-66, Figure 1). The microscope column 2 incorporates an electron gun 4 with a casing and an electron lens system which consists of a first condenser lens 5 and a second condenser lens 6 and an objective lens 7, as well as a deflection system of electron beam 8 for deflecting a focussed electron beam on a specimen during scanning operation. (*Id.*) According to the specification, the microscope column 2 is equipped with a main pumping system including three ultra-high vacuum pumps 12A to 12C. (*Tsutsumi*, col. 3, ll. 7-12.)

*Baum* discloses a shield 130 biased with respect to and positioned in the vicinity of a photocathode 10, 100 formed on a light-transmissive substrate 12, 122 such as glass. (*Baum*, p. 10, lines 21-25; p. 17, lines 15-27; p. 18, line 25 – p. 19, line 4; Figures 2 & 3.) An anti-reflection coating 40 is affixed to the surface of the light-transmissive substrate 12. (*Id.*) The photocathode 10, 100 on the light-transmissive substrate 12, 122 includes a diffusion blocking layer 42 on the anti-reflection coating 40, followed by an active layer 44 having a surface activation layer 46. (*Id.*, p. 11, lines 4-15, Figures 2 & 3.) A light beam generator 20 directs a light beam 22 through vacuum window 16 and through the light-transmissive substrate 12, 122 to an active emission area 26 of photocathode 10, 100, which light beam 22 causes the active emission area 26 to emit electrons into the vacuum region defined by an ultra high vacuum enclosure 14. (*Id.*, p. 7, lines 10-15, Figures 1-3.) A metal layer 70 deposited on the surface of photocathode 10, 100 has an opening that corresponds to the active emission area 26. (*Id.*, p. 15, 4-9, Figure 2.) Thus, the photocathode 10, 100 includes 4 layers: a diffusion blocking layer 42, an active layer 44, a surface activation layer 46, and a metal layer 70.

The photocathode 10, 100 is located within an ultra high vacuum enclosure 14. (*Id.*, p. 7, lines 5-7; p. 15, line 23 – p. 16, line 23, Figures 1 & 3.) Consequently, the shield 130 in the vicinity of the photocathode 10, 100 is provided within the UHV enclosure 14, since electron optics 54a to 54c are provided inside of the enclosure 14 in

beam direction subsequent to the photocathode 10, 100. (*Id.*, p. 13, lines 18-24; p. 15, line 23 – p. 16, line 23; Figures 1 & 3.) Thus, *Baum* provides no indication that the shield 130 is a gas diffusion barrier separating two UHV chambers which each have a vacuum flange and, therefore, can be evacuated separately. Rather, *Baum* fails to teach or suggest the subject matter of the claims in the application, such that the person of ordinary skill in the art would not refer to *Baum* for providing an improved charged particle emission component.

*Baum* also teaches that the shield 130 is biased at a potential that is approximately equal to the potential of the photocathode 100 or at a more negative potential to suppress emission of stray light electrons. (*Baum*, p. 17, lines 15-27.) Further, the shield 130 may attract and absorb ions that would otherwise have struck the cathode. The shield 130 also reduces contamination of components within the electron beam column. (*Baum*, p. 18, line 25 – p. 19, line 4.)

However, since the condenser lens 5 shown in Figure 1 of *Tsutsumi* is part of an electron lens system, it cannot be replaced by the shield 130 of *Baum*. Rather, replacing condenser lens 5 by shield 130 of *Baum* would not provide the effects of a condenser lens. Hence, a person of ordinary skill in the art would not combine the systems as they would not operate as desired.

Additionally, there is no suggestion in either *Baum* or *Tsutsumi* how to modify the condenser lens 5 of *Tsutsumi* in order to provide the effects of extracting or modulating emitted charged particles or the effects of the shield 130 disclosed in *Baum*, e.g. absorption and reduction of stray light electrons, ions, and contaminants generated by the emitter.

Further, if in the alternative the shield 130 of *Baum* is provided in the vicinity of the emitter of the electron gun 4 of *Tsutsumi*, the shield 130 would be positioned within the casing of the electron gun 4 in order to reduce stray light electrons, ions directed towards the emitter, and contaminants generated by the emitter. However, in this alternative, the shield 130 would not separate two different UHV chambers.

The Examiner asserts in the Advisory Action dated Aug. 31, 2009 that a person of ordinary skill in the art would be motivated by *Baum* to put the shield and the metal (parts 42, 70, etc.) onto the apertured separator (condenser lens 5) of *Tsutsumi* between the first and second aperture regions in Figure 1. The Examiner also asserts that the emission source would have been that of *Tsutsumi*.

However, contrary to the Examiner's assertions, 42 (the diffusion blocking layer) and 70 (the metal layer) are layers deposited on the photocathode 10, 100 as discussed above. They are not a residual gas diffusion barrier separating two UHV regions as recited in claims 1, 14, and 18. Moreover, because *Baum* teaches that parts 42 and 70 are deposited on the photocathode 10, 100, a person of ordinary skill in the art would position parts 42 and 70 on the cathode within the casing of the electron gun 4 of *Tsutsumi*. Thus, parts 42 and 70 would not separate two UHV regions if a person of ordinary skill modified *Tsutsumi* based on the teachings of *Baum*.

Additionally, even if the shield and parts 42 and 70 were put on the condenser lens 5 of *Tsutsumi*, they would not be provided in beam direction directly subsequent to the emitter, contrary to the present invention, since the emitter is provided in a casing of the electron gun 4 and the casing is provided in beam direction directly subsequent to the emitter. Moreover, *Baum* teaches that the shield is located in proximity to the cathode. (*Baum*, p. 21, lines 23-24.) Thus, according to *Baum*, a person of ordinary skill in the art would not be led to position the shield or parts 42 and 70 onto the condenser lens 5 of *Tsutsumi*, as the cathode of *Tsutsumi* is located within the casing of the electron gun 4.

Thus, combination of the references fails to teach, show, or suggest a charged particle emission component comprising a residual gas diffusion barrier separating the first and the second UHV regions, wherein the first and second UHV regions each have a vacuum flange, wherein the residual gas diffusion barrier is in beam direction directly subsequent to the emitter and acts as an electrode for extracting or modulating emitted charged particles, as recited in independent claim 1.

Additionally, combination of the references fails to teach, show, or suggest a charged particle emission component comprising a residual gas diffusion barrier in beam direction directly subsequent to the emitter, wherein the residual gas diffusion barrier separates the charged particle emission component into a first and a second ultra-high vacuum (UHV) region, wherein the residual gas diffusion barrier has an opening with a diameter larger than the diameter corresponding to the beam emission angle and acts as an electrode for extracting or modulating emitted charged particles, and wherein the first and the second UHV regions each have a vacuum flange, as recited in independent claim 14.

Combination of the references also fails to teach, show, or suggest a charged particle beam device comprising a residual gas diffusion barrier in beam direction directly subsequent to the emitter and separating the first and the second UHV regions, wherein the first and the second UHV regions each have a vacuum flange, wherein the residual gas diffusion barrier acts as an electrode for extracting or modulating the emitted charged particles, as recited in independent claim 18.

Furthermore, the nonobviousness of independent claims 1, 14, and 18 precludes a rejection of claims 2-4, 12, 15-17, and 22-24, which depends directly from either claims 1, 14, or 18, because a dependent claim is obvious only if the independent claim from which it depends is obvious. See *In re Fine*, 5 U.S.P.Q.2d 1596, 1600 (Fed. Cir. 1988), see also MPEP § 2143.03. Therefore, Applicants request that the Examiner withdraw the 35 U.S.C. § 103(a) obviousness rejection to claims 2-4, 12, 15-17, and 22-24, in addition to the rejection to independent claims 1, 14, and 18.

Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over *Tsutsumi et al.* and *Baum et al.* in view of *Knowles* (USPN 5,828,064)

The standards for determining whether a claim is obvious under 35 U.S.C. § 103(a) are discussed above.

Claims 10 depends directly from claim 1, and includes the elements and limitations recited therein.

As previously discussed herein, the teachings of *Tsutsumi* as modified by *Baum* do not describe, teach, or suggest a charged particle beam device having a residual gas diffusion barrier separating the first and the second UHV regions wherein the residual gas diffusion barrier is in beam direction directly subsequent to the emitter and acts as an electrode for extracting or modulating emitted charged particles, as recited in independent claim 1.

The teachings of *Knowles* do not satisfy the deficiencies of *Tsutsumi* and *Baum*. *Knowles* teaches that a guard ring 148 is placed outside of a detector ring 136 of an objective lens assembly 174 of an environmental electron scanning microscope. (*Knowles*, col. 11, line 46-col. 12, line 6, Figure 9.) Therefore, *Knowles* teaches that the guard ring 148 is an element of the objective lens assembly and positioned near the specimen, but not directly subsequent to the emitter.

Thus, combination of *Tsutsumi*, *Baum*, and *Knowles* fails to teach, show, or suggest a charged particle emission component comprising a residual gas diffusion barrier separating the first and the second UHV regions, wherein the first and second UHV regions each have a vacuum flange, wherein the residual gas diffusion barrier is in beam direction directly subsequent to the emitter and acts as an electrode for extracting or modulating emitted charged particles, as recited in independent claim 1 and claims dependent thereon.

As combination of *Tsutsumi*, *Baum*, and *Knowles* fails to teach, show, or suggest each of the limitations of independent claim 1, the Applicants respectfully assert that dependent claim 10 would not have been obvious to one of ordinary skill in the art at the time the invention was made, and respectfully request that the Examiner withdraw the rejection of dependent claim 10 under 35 U.S.C. § 103(a).

Claims 19 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Tsutsumi et al.* and *Baum et al.* in view of *Knowles* (USPN 5,828,064).

The standards for determining whether a claim is obvious under 35 U.S.C. § 103(a) are discussed above.

The Examiner asserts that claim the recitation "wherein the charged particle beam device has a residual gas diffusion barrier that is in beam direction directly subsequent to an emitter and acts as an electrode for extracting or modulating emitted charged particles" has not been given patentable weight because the recitation occurs in the preamble. (Final Office Action dated June 15, 2009, p. 11.) Claim 19 has been amended to include the recitation in the body of the claim.

Applicants respectfully assert that *Tsutsumi*, *Baum*, and *Knowles*, when combined, do not describe, teach, or suggest a method of operating a charged particle beam device comprising emitting a charged particle beam such that a portion of the charged particle beam is essentially not blocked by a residual gas diffusion barrier separating the first and the second UHV regions, wherein the residual gas diffusion barrier is in beam direction directly subsequent to an emitter and acts as an electrode for extracting or modulating the emitted charged particles, as recited in independent claim 19 as currently amended, and these differences between claim 19 and the combined teachings of the cited references would not have been obvious to one of ordinary skill in the art at the time the invention was made.

The teachings of *Tsutsumi*, *Baum*, and *Knowles* have been described above.

As *Tsutsumi*, *Baum*, and *Knowles*, when combined, do not teach or suggest a method of operating a charged particle beam device comprising emitting a charged particle beam such that a portion of the charged particle beam is essentially not blocked by a residual gas diffusion barrier separating the first and the second UHV regions, wherein the residual gas diffusion barrier is in beam direction directly subsequent to an emitter and acts as an electrode for extracting or modulating the emitted charged

particles, as recited in independent claim 19 as currently amended, Applicants respectfully assert that independent claim 19 could not have been obvious to a person of ordinary skill in the art at the time the invention was made considering *Tsutsumi* as modified by *Baum* and *Knowles*, and request that the Examiner withdraw the rejection of independent claim 19 under 35 U.S.C. § 103(a).

Furthermore, the nonobviousness of independent claim 19 precludes a rejection of claim 20, which depends therefrom, because a dependent claim is obvious only if the independent claim from which it depends is obvious. See *In re Fine*, 5 U.S.P.Q.2d 1596, 1600 (Fed. Cir. 1988), see also MPEP § 2143.03. Therefore, Applicants request that the Examiner withdraw the 35 U.S.C. § 103(a) obviousness rejection to claim 20, in addition to the rejection to independent claim 19.

Claims 5, 7, and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Tsutsumi et al.* and *Baum et al.* as applied to claim 1 above and *Tsutsumi et al.* and *Knowles* as applied to claim 19 above, and further in view of *Ooah et al.* (USPN 5,844,490).

The standards for determining whether a claim is obvious under 35 U.S.C. § 103(a) are discussed above.

Claims 5, 7, and 21 depend directly from claims 1 or 19, and include the elements and limitations recited therein.

As previously discussed herein, the teachings of *Tsutsumi*, *Baum*, and *Knowles* do not describe, teach, or suggest a charged particle beam device having a residual gas diffusion barrier separating the first and the second UHV regions wherein the residual gas diffusion barrier is in beam direction directly subsequent to the emitter and acts as an electrode for extracting or modulating emitted charged particles, as recited in independent claims 1 and 19.

The teachings of *Ooah* do not satisfy the deficiencies of *Tsutsumi* and *Knowles*. *Ooah* teaches an electron gun for emitting an electron beam having a tip that is a

substantially circular conic shape and a top surface substantially at the beam axis, multiple apertures between and/or apart of a cathode, anode, guide electrode, lens electrode, and forming a cross-over image of the electron beam. (*Ooaeh*, col. 8, lines 30-55.)

However, *Ooaeh* is silent regarding a charged particle beam device having a residual gas diffusion barrier separating the first and the second UHV regions wherein the residual gas diffusion barrier is in beam direction directly subsequent to the emitter and acts as an electrode for extracting or modulating emitted charged particles

Thus, combination of *Tsutsumi*, *Knowles*, and *Ooaeh* fails to teach, show, or suggest a charged particle emission component comprising a residual gas diffusion barrier separating the first and the second UHV regions, wherein the first and second UHV regions each have a vacuum flange, wherein the residual gas diffusion barrier is in beam direction directly subsequent to the emitter and acts as an electrode for extracting or modulating emitted charged particles, as recited in independent claim 1 and claims dependent thereon.

As combination of *Tsutsumi*, *Knowles*, and *Ooaeh* fails to teach, show, or suggest each of the limitations of independent claim 1, the Applicants respectfully assert that dependent claims 5 and 7 would not have been obvious to one of ordinary skill in the art at the time the invention was made, and respectfully request that the Examiner withdraw the rejection of dependent claim 5 under 35 U.S.C. § 103(a).

Additionally, combination of *Tsutsumi*, *Knowles*, and *Ooaeh* fails to teach, show, or suggest a method of operating a charged particle beam device comprising emitting a charged particle beam such that a portion of the charged particle beam is essentially not blocked by a residual gas diffusion barrier separating the first and the second UHV regions, wherein the residual gas diffusion barrier is in beam direction directly subsequent to an emitter and acts as an electrode for extracting or modulating the emitted charged particles, as recited in independent claim 19 as currently amended.

As combination of *Tsutsumi*, *Knowles*, and *Ooaeh* fails to teach, show, or suggest each of the limitations of independent claim 19, the Applicants respectfully assert that dependent claim 21 would not have been obvious to one of ordinary skill in the art at the time the invention was made, and respectfully request that the Examiner withdraw the rejection of dependent claim 21 under 35 U.S.C. § 103(a).

Claims 8, 9, and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Tsutsumi et al.* and *Baum et al.* as applied to claim 1 above and further in view of *Ishida et al.* (USPN 6,031,235).

The standards for determining whether a claim is obvious under 35 U.S.C. § 103(a) are discussed above.

Claims 8, 9, and 13 depend directly from claim 1, and includes the elements and limitations recited therein.

As previously discussed herein, the teachings of *Tsutsumi* as modified by *Baum* do not describe, teach, or suggest a charged particle beam device having a residual gas diffusion barrier separating the first and the second UHV regions wherein the residual gas diffusion barrier is in beam direction directly subsequent to the emitter and acts as an electrode for extracting or modulating emitted charged particles, as recited in independent claim 1.

The teachings of *Ishida* do not satisfy the deficiencies of *Tsutsumi* and *Baum*. *Ishida* teaches an ultra-high vacuum apparatus capable of shortening a baking time for outgassing treatment, where the vacuum has a vacuum container, a means for evacuating the vacuum container so as to maintain the inside as an ultra-high vacuum, and a valve means for connecting and disconnecting the inside of the vacuum container with and from the outside, where the valve includes a vacuum-tight seal made of a high molecular weight polymer. (*Ishida*, col. 2, ll. 18-37].)

However, *Ishida* is silent regarding a charged particle beam device having a residual gas diffusion barrier separating the first and the second UHV regions wherein

the residual gas diffusion barrier is in beam direction directly subsequent to the emitter and acts as an electrode for extracting or modulating emitted charged particles.

Thus, combination of *Tsutsumi*, *Baum*, and *Ishida* fails to teach, show, or suggest a charged particle beam device having a residual gas diffusion barrier separating the first and the second UHV regions wherein the residual gas diffusion barrier is in beam direction directly subsequent to the emitter and acts as an electrode for extracting or modulating emitted charged particles, as recited in independent claim 1 and claims dependent thereon.

As combination of *Tsutsumi*, *Baum*, and *Ishida* fails to teach, show, or suggest each of the limitations of independent claim 1, the Applicants respectfully assert that dependent claims 8, 9, and 13 would not have been obvious to one of ordinary skill in the art at the time the invention was made, and respectfully request that the Examiner withdraw the rejection of dependent claims 8, 9, and 13 under 35 U.S.C. § 103(a).

Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over *Tsutsumi et al.* and *Baum et al.* as applied to claim 1 above and further in view of *Wegman* (USPN 3,206,598).

The standards for determining whether a claim is obvious under 35 U.S.C. § 103(a) are discussed above.

Claim 11 depends directly from claim 1, and includes the elements and limitations recited therein.

As previously discussed herein, the teachings of *Tsutsumi* as modified by *Baum* do not describe, teach, or suggest a charged particle beam device having a residual gas diffusion barrier separating the first and the second UHV regions wherein the residual gas diffusion barrier is in beam direction directly subsequent to the emitter and acts as an electrode for extracting or modulating emitted charged particles, as recited in independent claim 1.

The teachings of *Wegman* do not satisfy the deficiencies of *Tsutsumi* and *Baum*. *Wegman* teaches an electron diffraction apparatus where steps are taken gas reactions, particularly, oxidations, are entirely or at least largely avoided. (*Wegman*, col. 1, ll. 60-66.)

However, *Wegman* is silent regarding a charged particle beam device having a residual gas diffusion barrier separating the first and the second UHV regions wherein the residual gas diffusion barrier is in beam direction directly subsequent to the emitter and acts as an electrode for extracting or modulating emitted charged particles.

Thus, combination of *Tsutsumi*, *Baum*, and *Wegman* fails to teach, show, or suggest a charged particle beam device having a residual gas diffusion barrier separating the first and the second UHV regions wherein the residual gas diffusion barrier is in beam direction directly subsequent to the emitter and acts as an electrode for extracting or modulating emitted charged particles, as recited in independent claim 1 and claims dependent thereon.

As combination of *Tsutsumi*, *Baum*, and *Wegman* fails to teach, show, or suggest each of the limitations of independent claim 1, the Applicants respectfully assert that dependent claims 8, 9, and 13 would not have been obvious to one of ordinary skill in the art at the time the invention was made, and respectfully request that the Examiner withdraw the rejection of dependent claims 8, 9, and 13 under 35 U.S.C. § 103(a).

Conclusion

In conclusion, the references cited by the Examiner, alone or in combination, do not teach, show, or suggest the invention as claimed.

Having addressed all issues set out in the Final Office Action, Applicant respectfully submits that the claims are in condition for allowance and respectfully requests that the claims be allowed.

Respectfully submitted,



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